PLASTIC DECK BOARD WITH SEPARATED DRAINAGE CHANNEL AND HOLD DOWN SURFACE

FIELD OF THE INVENTION

The present invention relates to a plastic panel assembly such as a plastic deck surface or the like formed by interlocking plastic deck boards.

BACKGROUND OF THE INVENTION

Plastic materials are becoming ever more popular in forming wood substitute products. By way of example, lumber boards used in making wooden decks are now often replaced by plastic deck boards. These plastic deck boards are extremely durable and require very little maintenance. Furthermore, they can be molded to include their own interlocks which eases assembly of a full deck surface using plastic deck boards.

One example of a plastic deck board used for forming a decking surface is shown in United States Patent 6,324,796. The deck board shown in the '796 patent is provided to its opposite sides with male and female interlock components. When two boards are secured side by side with one another the female interlock component is fitted with a fastening screw to hold one deck board down and then the male interlock component of the other deck board is inserted into the female interlock component of the first deck board. A moisture drainage gutter is then formed at the interlock directly above the screw mounted surface of the one deck board.

The above interlocking of side by side deck boards as described in United States Patent 6,324,796 is very effective from the standpoint of securing two boards side by side with one another. However, problems may arise in the gutter of the interlock where water could leak past

the screw through the bottom of the gutter onto the support surface for the deck. Typically, this support surface will have a wooden construction and if water continues to seep into the wood over an extended period of time the wood will rot resulting in a loss of integrity of the deck.

SUMMARY OF THE PRESENT INVENTION

The present invention provides a plastic panel assembly such as a plastic deck formed by at least first and second plastic boards. These boards are secured at an interlocked joint of the boards.

Both of the boards have the same construction with each board comprising a main body portion having first and second edge regions to opposite sides of the board. The first edge region has a top surface which is a continuation of the top surface of the main body portion of the board. The first edge region also has a first locking part. The second edge region has a bottom surface which is a continuation of the bottom surface of the main body portion of the board and also has a second locking part. The interlocked joint between the boards is formed by engagement of the first locking part of the first edge region of the first board with the second locking part of the second edge region of the second board.

The assembly further includes both a moisture drainage channel and a mechanical fastener receiving surface which are separated from one another at the interlocked joint.

According to a preferred aspect of the present invention the moisture drainage channel and the mechanical fastener receiving surface are both formed as

part of the second edge region of the board to opposite sides of the second locking part. The first locking part of the adjacent board not only secures with the second locking part but additionally secures within and completes closure of the moisture drainage channel.

As will be understood from the description above the securing of the boards to a support structure by a mechanical fastener is done at a location away from the moisture drainage channel. As such, the drainage channel has a solid non-perforated channel base ensuring that water cannot leak through the channel onto the deck support structure.

BRIEF DESCRIPTION OF THE DRAWINGS

The above as well as other advantages and features of the present invention will be described in greater detail according to the preferred embodiments of the present invention in which;

Figure 1 is a perspective view looking down on a building and attached deck assembly built from plastic deck boards according to a preferred embodiment of the present invention;

Figure 2 is a sectional view through one of the deck boards of the deck assembly of Figure 1;

Figure 3 is a sectional view showing the interlocking of deck boards and a starter strip for the deck boards of the deck assembly of Figure 1;

Figure 4 is a sectional view through a deck board according to a further preferred embodiment of the present invention;

Figure 5 is a sectioned perspective view of the joining of two of the deck boards of Figure 4 with one another;

Figure 6 is a sectional view showing a starter strip fitted to the deck board of Figure 4;

Figure 7 is a perspective view of a capping member used as a perimeter trim in building a plastic assembly according to a further preferred embodiment of the present invention; and

Figure 8 is a sectional view showing the mounting of the cap member of Figure 7 to a plastic deck board.

DETAILED DESCRIPTION ACCORDING TO THE PREFERRED EMBODIMENTS OF THE PRESENT INVENTION IN WHICH:

Figure 1 shows a plastic deck assembly generally indicated at 1 to the rear of a building. This plastic deck assembly is mounted atop a support structure 3. The support structure typically comprises a plurality of wooden stringers.

The deck assembly itself comprises individual plastic deck boards 5 interlocked edge to edge with one another. The deck boards are secured by mechanical fastening means such as self-tapping screws to the support structure 3.

A perimeter trim 7 is fitted around the outer edge of deck assembly 1.

Figure 2 shows in detail one of the deck boards 5 from deck assembly 1. The construction of deck board 5 is identical for all of the deck boards.

Deck board 5 has a molded and preferably extruded construction made in a continuous extrusion operation. Individual boards are then cut from the continuous extrusion at a length sufficient to span a relatively large decking surface. For example, the length of the deck board could be 16 feet for more.

The plastic material used to make the deck board is one which is sufficiently rigid to be essentially self supporting with ingredients to control thermal expansion and contraction of the board. Preferably, the bulk of the board is made from polyvinyl chloride with additional fiberglass or other thermal control ingredients in the PVC mix.

The construction of board 5 comprises a main board portion 7 which spans most of the width of the board. A first edge region generally indicated at 19 and a second edge region generally indicated at 35 are provided to opposite sides of the main board portion 7.

The main board portion includes an upper surface 9 and a lower surface 13 spanned by interior walls 15 of the board. The walls 15 divide the interior confines of the board into a plurality of hollow cells 17 across the board.

The upper surface 9 of the board in the preferred embodiment as shown is completed with treads or grips 11 which are formed as an integral part of the board. Treads 11 may be capstalk material co-extruded with the rest of the board during the extrusion forming process. These treads provide an upper gripping surface on the board which might otherwise be very slippery particularly under wet conditions. As a further benefit, if the treads are formed of a capstalk material such material

can be used to provide a colored upper surface on the board. In any event, the provision of treads 11 gives the upper surface of the board a somewhat decorative appearance.

The key to the present invention resides in how the boards interlock with one another. This is done in a manner to provide both a moisture drainage channel and a mechanical fastening surface which are totally independent of one another. The first and second edge regions 19 and 35 have been designed to provide these benefits of the board.

More particularly, the first edge region 19 has a top surface 21 which is formed as a continuation of the upper surface 9 of the main board portion 7. This edge region includes an outside face 23 at the side surface of a first locking part generally indicated at 24. This first locking part comprises a pair of downwardly extending barbs 25 and 27 spaced from one another by an upwardly opening recess 29. The two barbs 25 and 27 extend downwardly to a position well above the lower surface 13 of the main board portion. A relatively large open area 31 is provided inwardly of barb 27 next to the main body portion of the board.

The second edge region 35 of the board has a bottom wall 37 which is a continuation of the bottom surface 13 of the main board portion. A second locking part generally indicated at 42 extends upwardly from wall 37. This second locking part comprises a pair of upwardly projecting barbs 43 which extend to a position well below the upper surface 9 of the board. A downwardly opening recess 44 is provided between barbs 43. The second locking part formed by barbs 43 is separated from the main board portion by a channel region

39 having an open mouth 38.

The second edge region 35 is completed by a laterally extending flange or fin 45 which is separated from channel 39 by locking part 42. Fin 45 is predrilled with a plurality of preferably oval shaped holes as will be better seen and described with respect to Figure 5 of the drawings.

Figure 3 shows two of the boards 5 secured by an interlocked joint side by side with one another. This interlocked joint is formed by fitting the first edge region 19 of one of the boards with the second edge region 35 of the adjacent board. More particularly, the first locking part 24 of edge region 19 engages with the second locking part 42 of the second edge region.

Before joining the two boards to one another the one board i.e., the board to the left in Figure 5 is first mounted to the stringer beneath the board. This is done by means of a mechanical fastener comprising a self tapping screw 61 fitted through one of the predrilled holes in fin 45. The main body of the screw then embeds into the wood material of the stringer. Provided directly beneath the head of the screw is a sealing and preferably rubber washer 63. This washer prevents moisture from seeping past the screw into the wooden stringer.

In the setup shown in Figure 3 board 5 to the left hand side of the figure is a starter board i.e., it is the first board in the deck assembly adjacent the building shown in Figure 1. This board is therefore fitted with a starter strip generally indicated at 51. Starter strip 51 is put into position before board 5.

The starter strip has a construction very similar

to that of the second edge region 35 of the board. It comprises a flat vertical wall 53 and a bottom wall 55 at right angles to wall 53. Projecting upwardly from wall 55 are a pair of barbs essentially identical to barbs 43 of the second locking part 42. Provided to one side of these barbs inside of wall 53 is a channel region 57. Provided to other side of the locking barbs is a fin 59. This fin like the earlier described fin 45 includes predrilled holes to receive one of the mechanical fasteners 61.

It is to be noted that the interior surface of wall 53 is provided with a small notch to receive the tooth 33 on the outside face 23 of edge region 19. Further description with respect to this tooth and notch interlock will be provided immediately below in respect of the interlocking of the edge regions of adjacent boards.

Returning now to the board interlock, it will be seen that barb 27 of the first locking part is pushed downwardly into recess 44 between the two barbs 43 of the second locking part. At the same time barb 25 of the first locking part is forced through the mouth 38 of channel region 39 to locate within the channel. The reversed angled shaping of the heads of all of the barbs causes them to positively interlock with one another. The somewhat flexible nature of the plastic material forming the interlocking components allows the barbs to slip past one another in forming the interlocked joint. The head of barb 25 fitting into channel 39 not only provides a positive locking action but in addition completes the formation of the channel so that the channel is completely closed around its inner confines.

Channel 39 acts as a moisture drainage channel for

any water than may collect within the boards. This water is typically produced as a result of condensation. However, the water cannot seep through the base of the channel due to its solid non-perforated construction. The solid channel base is provided as a result of the securing of the board to the stringer at a location away from the moisture drainage channel.

In order to assist in draining any moisture that may build up within channel 39, the deck is preferably built at a very slight angle from horizontal thereby tipping the channel from one end to the other. This tilted angling of the deck is extremely minimal so as not to be visually apparent. Only a very minor tilting is required to cause water under the influence of gravity to flow out of the channel.

When the first edge region 19 of the one board is snapped downwardly into the second edge region of the other board as described immediately above, a further locking action occurs between the boards. This second locking action is provided as a result of the tooth 33 on the first edge region snapping into notch 47 of the vertical face 41 of the second edge region. Note that the tooth 33 has a triangular shape with a flat upper surface and a downwardly inwardly inclined lower surface. This inclined surface allows the tooth to cam its way into and then lock within the correspondingly shaped notch 47.

The provision of the second interlock between tooth 33 and notch 47 provides a number of benefits. For example, this second interlock greatly resists tipping of one board relative to the other board. This feature is particularly beneficial when the two boards are used as a horizontal tread on a stair having vertical risers. One

of the boards sits directly adjacent the vertical riser and a person stepping on the outside edge of that board will produce a levering action on the board urging the interlocked edge of the board to want to tip or rise upwardly from its interlocked position. The interlock provided by tooth 33 and notch 47 blocks this tipping action.

Another beneficial feature provided by the dual interlocks i.e., the interlock extending both vertically and horizontally of the edge to edge boards is that when both interlocks engage there is a very audibly noticeable snap connection between boards. This confirms to the person installing the deck boards that they have been positively interlocked with one another.

Figures 4 through 6 of the drawings show the use of a further preferred embodiment deck board generally indicated at 75 to be used in forming a plastic deck assembly. Deck board 75 although interlocking with adjacent deck boards in a different manner from the interlock described immediately above with respect to Figure 3 still includes the advantages and features found in the earlier described interlock.

Board 75 like the earlier described board is preferably formed in a continuous plastic extrusion process. It is then cut to lengths suitable for use in forming an assembly such as a decking surface or the like.

Each board 75 comprises a main generally hallow cellular board portion 77. First and second edge regions 79 and 91 are provided to opposite sides of the main board portion.

Edge region 79 has an upper surface which is a continuation of the upper surface of the main board portion. It also includes a lower wall 81 at a position well above the lower surface of the main board portion. An upwardly opening concave recess 83 is provided in wall 81. Located beside recess 83 is an open region generally indicated at 84 beneath wall 81.

A generally rounded head portion 85 projects sideways from edge region 79. A triangular shaped notch 87 is provided in the upper surface of head 85 at a position below the upper surface of the deck board.

The second edge region 91 comprises a bottom wall 93 which is a continuation of the bottom surface of the main body of the board. A projection 95 extends upwardly from wall 93. This projection which has a convex upper surface 96 terminates well short of the upper surface of the board.

A channel region 99 above wall 93 is provided to one side of projection 95. Provided to the other side of projection 95 at the extreme outer edge of the board is a laterally extending fin 97. As can be well seen in Figure 5 of the drawings, fin 97 is provided with oval shaped openings 98 which are extended lengthwise of the board.

Figure 5 shows two of the boards 75 interlocked edge to edge with one another. The interlocking of these boards is performed in an extremely efficient locking manner. The head portion 85 of the first edge region 79 of the one board is fitted in a downwardly angled position through the open mouth 101 of channel region 99 of the second edge region 91 of the other board. From here the upper convex surface 96 of projection 95 of edge

region 91 is placed within the convex recess 83 of the other edge region 79. Once the two boards are in this position the inclined board is then swung down to a horizontal position with the curved recess in wall 81 of edge region 79 locking on the curved top surface 96 of projection 95 in edge region 91. The rocking will continue until notch 87 in head portion 85 of edge region 79 locks over the tooth 103 in the roof of channel region 99 of edge region 91. As can be seen in Figure 5, once this interlocking position has been achieved and with the fin 97 of the board to the left side in Figure 7 already screw mounted to its supporting stringer the board to the right side of Figure 5 can neither pull laterally away from nor tip upwardly relative to the board in the left hand side of Figure 5. As such, the interlocked boards of Figure 5 are particularly suited for forming a stair tread in which foot pressure applied to the edge of the board only serves to reinforce the interlock between boards.

As best seen in Figures 4 and 6 of the drawings, small notches 78 are provided at separated locations in the upper surface of the board. These notches like the notches 22 in the upper surface of board 5 allow the board to be cut to different widths. This is a feature which would be used where the board needs to fit across a fixed sized surface area that is narrower than the width of the board. The board can then be trimmed at any one of the notches 78 to the required board width. The edge of the board from which the material has been trimmed can then be screwed down through the bottom surface of the remaining board portion.

Consistent with the earlier described embodiment it will be seen in Figure 5 that the head portion 85 of the first edge region 79 locates within and completes the

closure of the moisture drainage channel 99 of the second edge region 91. Furthermore, the interlock formed by the locking part 95 on edge region 91 and the recess 83 of wall 81 on edge region 79 separates drainage channel 99 from fastener receiving fin 97. Also consistent with the earlier described embodiment is the feature that the first edge region includes an open area on its under surface i.e., area 84 to receive the mounting screws through the fastener fin without interfering with the interlock.

The provision of the predrilled holes 98 in fin 97 which are the same as those found in but not shown with respect to fin 45 of board 5 prevents cracking of the fin when installing the mounting screws.

The elongated shaping of the mounting holes 98 provides a thermal expansion and contraction control. When the screws are fitted down through the holes 98 they are placed centrally of the holes leaving space to either side of the screw mount. The boards which may have some tendency to expand and contract lengthwise under very hot and very cold weather conditions respectively are allowed to shift relative to the supporting structure for the deck assembly. This shifting occurs without any buckling or uplifting of the boards from the supporting structure because of the elongated shape of mounting fin openings 98.

In the event that there is any relative differences in expansion and contraction between adjacent boards the interlock between the boards, although extremely positive in a vertical direction will allow relative axial movement of the boards in the assembly.

Each of the boards shown in the drawings has a

preferred width span of about 6 inches. This width span includes the interlock edge regions to both sides of each board. When two boards interlock with one another their combined width span is something less than 12 inches because of the overlapped nature of the first edge region of one board with the second edge region of the adjacent board. Using these dimensions the securing fins of every other board are separated from one another by about 16 inches to mount with a conventional supporting structure having crossbeams at every 16 inches.

Figure 6 of the drawings shows board 75 which will be the first board into a deck assembly as being fitted to a starter strip generally indicated at 111. This starter strip has a very similar construction to the second edge region 91 of the board.

More particularly, starter strip 111 comprises a top surface 112 and an outer sidewall 113 at right angles to top surface 112. The starter strip further has a bottom surface 115 with a projection 117 having a rounded top protruding upwardly from the bottom surface of the starter strip. The wall recess 83 of edge region 79 rocks on the rounded convex top of projection 117 to locate the head 85 of wall region 79 against the roof of drainage channel 119 in starter strip 111. The starter strip includes a downwardly projecting tooth 123 which locks into the tooth receiving notch 87 of head portion 85. A securing fin 121 located to the other side of projection 117 from drainage channel 119 is used to secure the starter strip into position before interlocking with board 75. Fin 121 like the fastener receiving fin on the actual board is provided with pre-punched or drilled elongated openings for receiving the sealing mounting screws to secure the starter strip to the support surface.

Figure 7 of the drawings shows the perimeter trim 7 around the deck assembly 1 of Figure 1. The same perimeter trim is used around a deck using boards 75 of Figures 4 through 6.

The perimeter trim 7 is again preferably made in a continuous extrusion process and cut to desired lengths. It also preferably has the same material makeup as the plastic used in forming the boards.

The construction of the perimeter trim which has a generally C channel shape comprises a vertical wall 135 and a pair of horizontally extending legs 137 and 139. A rib 141 projects from wall 135 to the interior of trim piece 7. This rib includes a score groove 143 that is used for trimming the rib in the event that it is not needed.

A further rib 145 having a score groove 147 extends downwardly from the lower leg 139 of trim piece 7.

As best seen in Figure 8 of the drawings legs 137 and 139 of the trim piece are completed at their outer ends with bevels 151 and 153 inclined downwardly inwardly at the open side of the channel.

During the actual formation of trim piece 7 the two legs 137 and 139 are not formed at 90 degrees to the back wall 135 of the trim piece. Rather they are set in a slightly inwardly pinched position where each of the legs is at an angle slightly less than 90 degrees to the back wall 135. The trim piece is however sufficiently flexible to allow the legs to be opened form one another and over the upper and lower surfaces of board 5. The memory of the plastic material in trim piece 7 will cause

the legs to want to reassume their naturally formed positions such that the trim piece clamps onto the edge of the board. This produces a very positive interlock between the trim piece and the board. If needed, further securing can be provided by screwing the trim piece at its lower leg 139 upwardly into the undersurface of the board. In this position the screw connection between the trim piece and the board is completely hidden and does not detract from the appearance of the deck.

As will be seen in Figure 8 rib 141 acts as a spacer or standoff to accurately locate the trim piece on the edge of the board. As a result of the provision of rib 141 a ventilation channel 151 is provided between the trim piece and the board. This ventilation chamber allows the flow of air through the interior cells of the edge to edge boards around the perimeter of the deck assembly. This in turn adds significantly to cooling of the entire deck assembly which even under hot weather conditions remains cool to the touch.

The provision of the bevels 151 and 153 on the legs 137 and 139 respectively eliminates abrupt or sudden changes between the edge of the perimeter trim and the external surfaces of the board. With the more gradual transition from the perimeter trim to the board surface, there is much less likelihood of jamming an object against the exposed ends of the perimeter trim.

The downwardly extending rib 149 on the undersurface of leg 139 acts as a drip rail to prevent moisture flowing around the perimeter trim and back onto the wooden stringer assembly supporting the deck assembly. Once again, this substantially reduces rotting of the deck support.

As will be appreciated from all of the description above a deck or other assembly is quickly and easily put together with an extremely positive interlock between adjacent boards. That interlock is designed such that it can be positively secured by mechanical fasteners to a supporting structure at a location away from the moisture drainage channel of the interlock. Further the assembly or even part of the assembly can easily be dismantled and then reassembled without damaging any of the boards in the assembly. This makes it extremely easy to replace a single board of the assembly without having to take the entire assembly apart.

Although various preferred embodiments of the present invention have been described in detail, it will be appreciated by those skilled in the art that variations may be made without departing from the spirit of the invention or the scope of the appended claims.